FLIGHT RECORDERS THAT RISE TO THE CHALLENGE

Flight recorders are already meeting the optical data needs of today's military aircraft

The amount of sensor data collected by military aircraft has grown tremendously in recent years – especially in the optical realm. While this dramatically improves situational awareness, it also greatly taxes the flight recorders in a way never seen before.
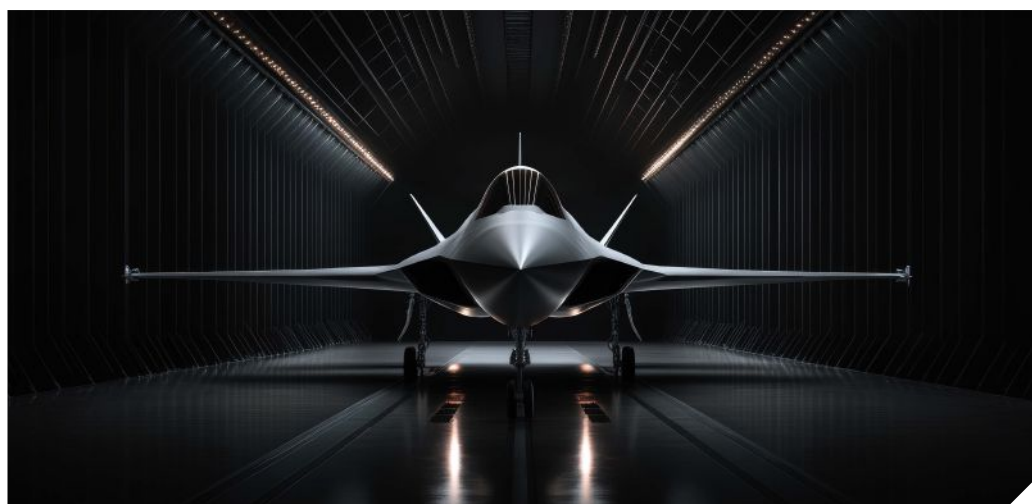
The industry is racing to find answers to a critical challenge – how to source ruggedized, flight-worthy recorders that can transmit and store enormous amounts of data at extreme rates. These new platforms and systems present unprecedented data generation and recording requirements, creating demand that most current offerings cannot meet.

It's a problem Calculex has been addressing for over 30 years, and the company is rising to the challenge with solutions that have already achieved the DoD's Initial Operating Capability (IOC). The company is also ramping up to provide even greater capabilities as optical sensors grow more prevalent and will undoubtedly be standard equipment on all new military aircraft going forward.

Many newer flight recorders can provide a previously unheard-of data rate of 10GB ethernet on one band. Now, the industry is asking for a step change in transmission speed, with multiple 10Gbps ethernet channels alongside ones with 25Gbps capabilities.

To meet these requirements, Calculex developed the Raptor – a high-speed fiber optic data recorder supporting 2Gbps, 10Gbps, and 25Gbps per channel. With 24 available channels, the Raptor represents a new standard that enables a distinct, yet synchronized, channel for each sensor — fully programmable by the user.

To store vast amounts of data, this unit features an ultra-high density Removable Memory Module (RMM), that offers 132TB capacity, expandable up to 570TB. To meet the high-stress needs of the aircraft environment, the Raptor is completely ruggedized and fits into a remarkably small case weighing only 35 lbs (16kg). It also has robust thermal-management capabilities to keep the unit cool, with even greater advances planned for future models.

In today's threat environment, aircraft equipped with the capacity to handle optical, radar, IR and other inputs will rely on a fast optical ethernet backbone — a vast leap from yesterday's 1553 standard. The Raptor's ability to record up to four hours at these advanced speeds is a true first in the industry, as is the ability to stream data continuously without any buffering or the need to stop and save data.

As Calculex looks to further enhance the capabilities of these recorders, the company is working on RMMs that can manage up to 730TB of data without expansion. In an ISR scenario, for example, this would allow for real-time monitoring of multiple sensors while recording all the radar transmissions trained on an aircraft. This defensive capability empowers a pilot to easily map out anything on the ground targeting the aircraft.

Impressive as that is, Calculex is already fielding requests for even higher speeds. This will be addressed with four, 25Gbps ethernet channels that can be combined into 100Gbps. Critical here is the ability to time-align all these inputs so that, regardless of the media, up to 24 channels can be merged into one recording. These are precisely overlaid within sub-microsecond accuracy and continuously checked with one another to reveal any anomalies.

Calculex set the standards for flight recorders since the early 1990s. With the ever-increasing need for speed and storage housed in small, ruggedized units, the company is at the forefront once again in creating advanced solutions for military aircraft today — and tomorrow. \\

1 // Modern military aircraft feature greater situational awareness, which produces more data to record

2 // Flight recorders such as Calculex's Raptor provide increased speed and capacity to deal with large amounts of data

3 // The Raptor features 24 high-speed fiber optic channels